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The Integration of GIS-Based Information Mapping into an Ethnohistorical Seminar

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Abstract: A GIS-based project constructing a digital, interactive map of the Native American experience served as a useful tool for creating student ownership of the learning process in an undergraduate seminar on the indigenous cultures of the Americas. Student researchers collected primary documents, linguistic data, maps and other images, bibliographic resources, links to relevant web resources, and brief encyclopedia-style essays. The information was then integrated into a GIS dataset for use with ArcMap software, with the ultimate goal of compiling a digital resource that would be refined and expanded by future waves of students in this course.

Keywords: GIS, ARCGIS, ARCMap, historical database, ethnohistory, Native American History, seminar, teaching, active learning, problem-based learning, Barry Robinson, Barry M. Robinson, Barry Matthew Robinson

The teaching of history has often been described as a "conversation" about the past. As a former professor of mine once put it, the instructor may speak from a more informed position, and exert some control on the flow of information, but should always maintain the goal of "providing students with the means of participating ever more fully in the dialogue." [1] Ideally, both sides learn from this experience. Teaching thus provides both the opportunity to increase one's own mastery of a subject, and the challenge of inspiring students to genuinely participate in the conversation.

With this concept in mind, I set about envisioning the sort of conversation I might create as a part of a new upper-level seminar on the history of the indigenous cultures of the Americas. I was encouraged in this effort by my university's Center for Teaching, Learning, and Scholarship. The center and our College of Arts and Sciences have placed a strong emphasis on Problem-Based Learning (PBL). The PBL approach presents students with a complex, open-ended research question and then provides them with the means to address it, rather than simply conveying information (or "answers") for the students to absorb. In this scheme, the professor should spend more time as a facilitator of student learning than as a transmitter of facts. Although there is a growing literature on PBL spanning numerous academic

disciplines, more than anything it was the harmony of this basic strategy with my own educational experience that appealed to me, rather than any particular study or theory of pedagogical effectiveness. [2] How better to teach history than to equip students to learn it for themselves?

The imperative of this approach is not news to anyone who has been teaching history in the twenty-first century. As the *Homo universalis* continues to go the way of the *Homo neanderthalensis*, human society produces knowledge at an exponential rate, and increasingly privileges the ability to access a vast range of specialized data over the mastery of general knowledge. Each new academic year, student researchers must wade through thousands of new references for printed sources and billions of new bytes of information available online. In fact, as Lynn D. Lampert has noted, today's undergraduates often assume that "everything they need to conduct and complete an assignment can be found online through freely available Internet resources." [3] Professors of history have a responsibility to help our students go beyond a superficial Google search in the quest for research material, and to critically evaluate those sources that they do find. With the scope of our seminar spanning several centuries and two continents, my students had to be prepared to identify and interpret a wide range of primary and secondary source material. I needed to construct the course as a platform for shaping common meaning out of their disparate research experiences. As it turned out, a GIS-based communal project constructing a digital, interactive map of the Native American experience served as the foundation for such a platform, helping my students to develop a broader range of research skills and historiographical competence than they might otherwise have achieved.

Developing Ethnohistorians

In developing the course model and objectives, I wanted my research interests to inform my teaching. Since my work on the social and cultural history of western Mexico overlaps with anthropological studies of the region's indigenous communities, I decided to present the course as an ethnohistorical seminar. But how should I introduce students to the theory and practice of ethnohistory?

Having emerged from the shared frontier of anthropology, Native American studies, and cultural history, ethnohistory embraces a multidisciplinary methodology in its effort to understand cultural change over time. James Axtell, one of the earliest scholars in the field, once defined ethnohistory as "the use of historical and ethnological methods and materials to gain knowledge of the nature and causes of change in a culture defined by ethnological concepts and categories." [4] Although this might seem somewhat self-referential, Axtell went on to explain that this should result in scholarship that combines both the "diachronic dimensions of history" and the "synchronic sensitivity of ethnology." In other words, ethnohistory is (in theory)

practiced by chronology-conscious anthropologists and culturally-aware historians. [5]

Axtell listed three specific elements of this enterprise, wherein the subject of study is culture, an "emphasis [is placed] on socio-cultural change," and "the use of historical methods and materials [encompasses] a far greater variety of sources than books and manuscripts." [6] The scope of this enlarged set of source material has ranged widely, from anthropological field studies and oral interviews to art and artifacts, in addition to conventional documentary sources. With a few exceptions, however, ethnohistorians as a whole do not appear to have embraced digital research methods (spatial mapping technology, for example) to the same extent. [7]

Although the field of ethnohistory has been well-established for decades, relatively few undergraduate history majors are exposed to this methodology, despite its fundamental significance for many subject areas, beyond the obvious example of Native American history. [8] Consequently, I hoped to provide my students with an introduction to ethnohistory as a discipline, and to draw them into historiographical discussions that I regularly engage in my own work. Sticking with the PBL emphasis on active learning, I sought a way to equip the students to conduct research and enter scholarly debates over issues such as land usage, race and nationalism, and acculturation, on their own terms.

In planning the course, I faced the ever-present balancing-act that accompanies the teaching of history, particularly beyond the survey level; how to provide the necessary framework of general knowledge while simultaneously encouraging students to engage complex issues as independent thinkers? In seminars populated by upperclassmen, the tendency is to lean toward depth rather than breadth. This was my plan as well, but a few hurdles stood in the way. I had decided to take a comparative approach to the study of Native American history (broadly conceived, and including Latin America). In part, this decision stemmed from a desire to transcend nation-centered approaches to the field. As a Latin Americanist looking northward, I often notice transnational (and of course, pre-national) problems that span the hemisphere, and this course gave me an opportunity to generate an instant and captive audience with which to pursue these questions.

For obvious reasons, I could not teach the course as a comprehensive survey of the entirety of the Native American experience. Instead, I wanted to identify a few central themes from recent work on indigenous cultures in both North and South America, and help the students enter into some of the more significant scholarly debates about these themes. As with any reasonably large field of historical inquiry, scholars have approached the study of the indigenous cultures of the Americas from many different angles. I needed to help students develop some sense of the

predominant narratives of the indigenous experience, so that they would have a framework of knowledge from which they could dive into some of the more complex issues we would cover. Thus my dilemma; how to provide a broader, comparative element in a course that would have otherwise centered on narrow discussions of course readings and key themes?

Building on the traditional seminar format, but with an eye toward integration of a PBL research element, I chose to explore these central themes in a hybrid seminar/workshop format. Like a traditional seminar, students in the course were responsible for regular reading assignments; in this case structured around five books, each representing a different form of historical writing, moving chronologically from the pre-contact period through the colonial era and into the modern experience. We began with Charles C. Mann's *1491: New Revelations of the Americas before Columbus*, a synthesis of recent scholarship on pre-contact civilizations that proved to be an engaging, and sometimes provocative, introduction to our subject matter. [9] The book served as an excellent jumping off point for our foray into the secondary literature, and I would highly recommend it for any undergraduate course.

We then progressed through a detailed monograph on the 1781 Andean insurgency by Sinclair Thomson, a narrative account of the Creek and Seminole wars, and a collection of essays on Native Americans and modernity in the U.S. by Philip Deloria. [10] Although the Thomson book is best suited for a graduate-level seminar, it allowed those students who could get past the denser academic language and theory to think deeply about the changing nature of identity in the context of late colonial Andean society. Sean Michael O'Brien's narrative of the Creek and Seminole wars proved an easier read, but less fulfilling as a means of engaging the historiographical literature. Deloria's *Indians in Unexpected Places* is a masterful, witty, postcolonial consideration of indigenous identity in the late nineteenth and early twentieth-century United States, and would benefit the reading list of any thoughtful undergraduate or graduate seminar. We concluded by studying Rigoberta Menchu's controversial edited autobiography, *I Rigoberta*, which brought home the contemporary relevance of struggles for indigenous rights while also prompting a vigorous discussion of ideological context, cultural identity, and the possibility of objectivity in historical writing. [11]

Thus, the seminar element of the course centered on the traditional elements of critical reading and discussion. Students demonstrated mastery of these skills by serving as discussion leaders for our in-class conversations, writing professional reviews of three of our five books, and posting short, periodic, reflective essays online in response to questions relating to the themes we discussed in class.

Mapping Culture: The ERICA Project

The cornerstone of the course, however, and the element that served as a unifying forum for shaping the "common meaning" mentioned above, was the GIS workshop component. My introduction to the idea of utilizing GIS technology as a pedagogical tool had come during my first year as an assistant professor, preparing to teach Samford's established but innovative survey of world history. As discussed by my colleague James Brown in the previous issue of this journal, Samford initiated the Academic Excellence and Geographic Information Systems (AEGIS) project in 2003. AEGIS was a multidisciplinary effort to introduce GIS research methodology in a number of different courses throughout the College of Arts and Sciences, supported by the National Science Foundation's Course, Curriculum, and Laboratory Improvement program. Dr. Brown implemented a GIS-based mapping element into a final research project for the world history survey. Students researched a movement or pattern along one of history's "great roads" (transportation corridors of socio-economic, cultural, and political transit such as the Grand Trunk Road in South Asia) and put together a GIS or Google Earth-based presentation to illustrate their conclusions.

I had always favored utilizing maps and images to help students envision the historical settings we discuss, and the opportunity to introduce dynamic mapping software into my courses was greatly appealing. Given the presence of an existing plan for incorporating GIS into the course, it was also less daunting than it might have been. Despite the inherent challenges involved in providing students with sufficient technical fluency in the use of ArcGIS software, (also discussed in James Brown's article), we found that this model effectively encouraged students to develop a greater sense for the historical context of their research topics, and resulted in more in-depth, considered analyses than might typically be the case. [12]

Given this positive experience with GIS in the world history survey, as I approached the opportunity to develop my Native Cultures seminar I naturally considered incorporating a GIS element into the syllabus. Other historians have noted that computer-based course projects can lead to "higher levels of interactivity, decentralization of learning, and student empowerment." [13] I suspected that, combined with WebCT/Blackboard, our university's online course management system, a GIS-based database might help integrate student research into a coherent platform that would then be useful to the class as a whole, and perhaps to others in the future. [14]

To that end, I designed a GIS-based communal project to serve as the central element of the course: the construction of an interactive digital "map" integrating the historical data we collected during the course. Each of my students was assigned as a researcher for a specific ethnic group, responsible for collecting standard sets of

information and submitting it through our web-based course-management system Blackboard (previously known as WebCT) for incorporation into a centralized data-set in ArcGIS. After an in-class discussion on the purpose and scope of the assignment, we decided to name the project the "Electronic Resource on the Indigenous Cultures of the Americas" (ERICA). The map spanned both North and South America, and included twelve ethno-linguistic people groups, eventually represented by colored, "clickable" shapefiles in ArcMap.

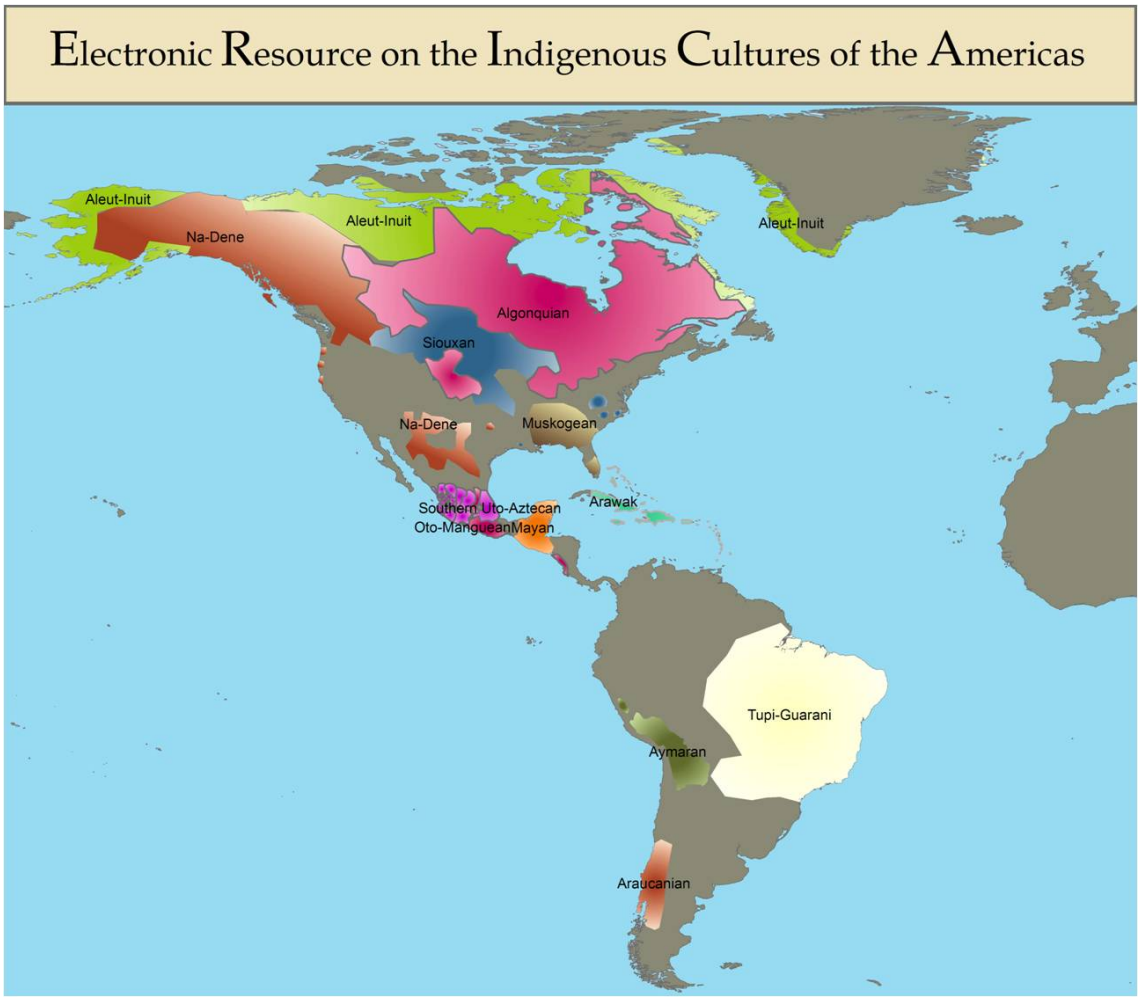

FIGURE 1: The Electronic Resource on the Indigenous Cultures of the Americas

The purpose of the project was two-fold. As a fundamental course goal, I hoped to create student ownership of the learning process by involving them in a project that would outlive our class, encouraging students to value the learning process for its own sake rather than just as a means to an end. Given the thematic emphasis on specialized readings and in-depth seminar discussion, the ERICA Project could also provide students with a better sense of the big picture of Native American history broadly-conceived; a picture that the students, themselves, helped piece together.

They would each function as an ethnographer of their assigned group, bringing their growing expertise to bear in our consideration of major problems in the history of the indigenous peoples of the Americas.

As mentioned in the previous issue of the JAHC, two workshops at the 2007 meeting of the American Historical Association in Atlanta, Georgia considered the topic of "Exploring Historical Space and Environments in the History/Social Studies Classroom." [15] In the discussion following the presentations, a number of participants noted that the lack of available data presents one of the most daunting obstacles to the use of digital mapping technologies in the classroom. Our approach to this dilemma was to enable students to produce the data themselves, by conducting research and formatting their findings for incorporation into the communal database for use with ESRI's ArcMap software. [16] Students completed ten separate research assignments over the course of the semester. The information collected included primary sources, maps and other images, bibliographic resources, links to relevant web resources, and brief encyclopedia-style essays composed by the students themselves. The topics for a given assignment were the same for all students, and ranged from "Origin Stories" to specific questions relating to "Race and Nationalism." Students would essentially digitize their research, (by creating a .jpg file from a printed or drawn map, or compiling a spreadsheet of place names and shapefiles, for instance), and submit it to me through the course management system. The ultimate goal of integrating the resources to this GIS database was to create a digital resource that would be refined and expanded by future waves of students in this course, and that could eventually be made available for public access.

To begin, each student identified the best available scholarly sources in an effort to delimit the geographical boundaries of their group. [17] As anticipated, this was not an easy task, and gave rise to discussions of fluidity, land use, and "triangulation" from multiple sources. Each student "ethnographer" was responsible for drawing the region inhabited by their language group onto a master map template (digitally or scanning in from a hand-drawn image). I then transposed these images into the shapefiles in ArcMap. [18] Figure 1 shows a compilation of the students' depictions of indigenous language groups at the point of first contact with Europeans. The students' boundaries have been left as drawn (sometimes overlapping), rather than with the edges smoothed or trimmed. The shapefiles would then serve as the point of entry into the rest of the data for the specific language groups, categorized in individual fields through ArcCatalog.

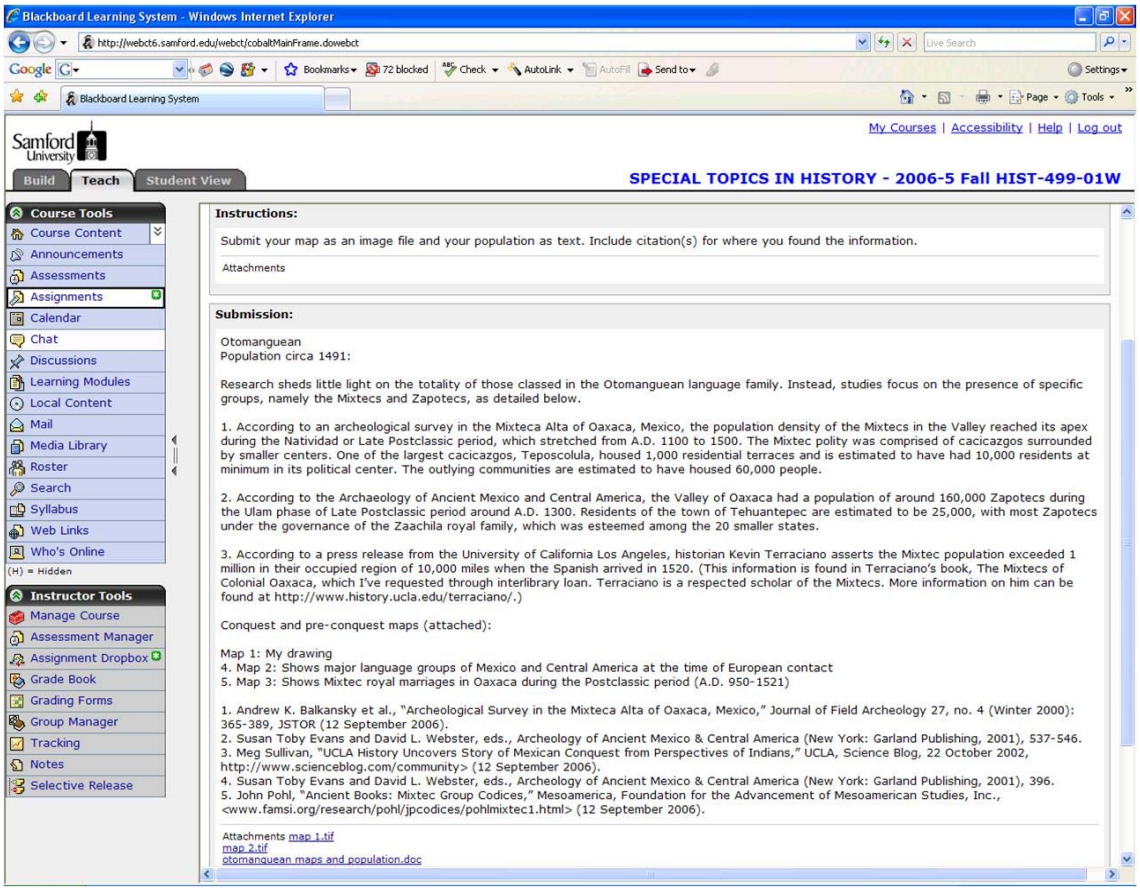

FIGURE 2: Sample Student Submission through Course Management System

Each student researcher collected the following for their assigned people group:

1. A map of the group in the present day.
2. A story of the group's origins (oral tradition or scholarly analysis).
3. A pre-contact map and population estimate.
4. A primary account of one of the group's early encounters with Europeans/Africans.
5. Place names and other common terms originating from the research group's language. [19]
6. Early episodes of "conquest" [broadly conceived] that could be mapped.
7. An episode of resistance to colonial powers and/or later national governments.
8. A characterization of the group's "adaptation" to the culture(s) around them, and vice versa. (This could include any significant periods or moments of adaptation, whether in terms of language, economy, religion, politics, or material culture).
9. A map (or maps) and/or records of the dispossession of land from the group as national governments expanded (through treaties, conquest, privatization policies, or other factors).

10. Evidence of transformations in the status of the group as "Indians" over the course of the 19th and 20th centuries. How was their status and/or ethnic identity affected as a result of relations with national governments and national cultures?

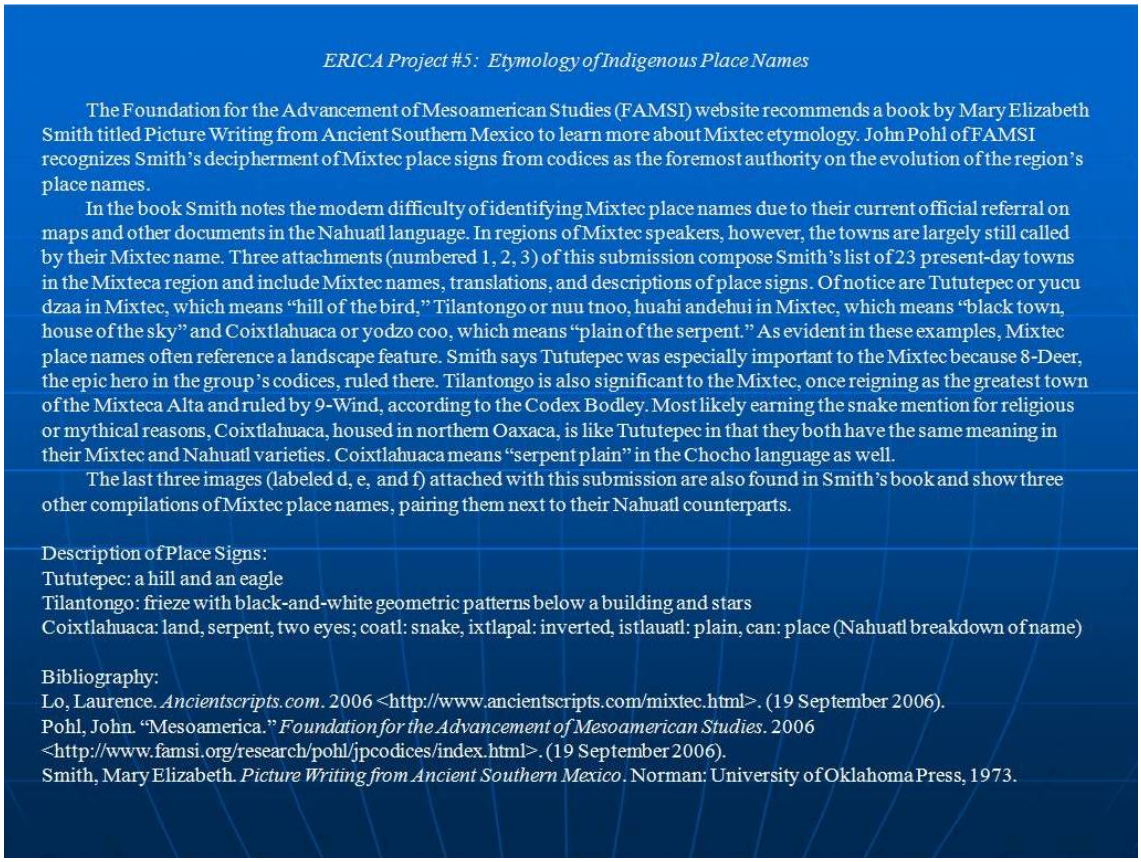

FIGURE 3 Etymologies of Indigenous Place Names I

FIGURE 4: Etymologies of Indigenous Place Names II

In each case, students were asked to identify web links to relevant texts, map images, or other resources, and citations for all sources consulted. They then formatted their research for integration into the GIS database as text, image, or spreadsheet data. Finally, the students uploaded this information through the course management system, where I could review and grade it. During each class period following the completion of an assignment, we would generate a comparative discussion of the assignment's theme.

Project Outcomes and Assessment

In practice, the undertaking of this research proved both challenging and stimulating, in the sense that it provoked in-class discussion of questions faced by all ethnographers, historians, geographers, and anthropologists. How do you define a people group? Self-identification? Categorization on census records or other government documents? Language? Dress? Who are the present day "Aztecs," for instance? Those who speak Nahuatl as their native language? This would

include the descendants of far more distinct cultural groups than those people known as the Mexica who ruled the Aztec Empire from their island capital of Tenochtitlan.

In the end, the process of "thinking spatially" enhanced the intellectual atmosphere of the class as a whole. As students re-imagined the spatial trajectories of their group's histories and pre-histories, they also reconsidered their pre-suppositions about the trustworthiness of received wisdom, and the role of myth in cultural (and academic) discourse. What is the academic merit of an "origin story" passed down through oral histories? Is a scholarly article outlining a cultural group's migration from such and such a place at such and such a time somehow incontrovertible "fact," while an indigenous account remains in the realm of "myth"? How reliable are maps of indigenous populations drawn by European colonists? How reliable are maps of the conquest drawn by indigenous participants? How do we resolve discrepancies among different contemporary scholars' maps of pre-contact indigenous settlement?

As we wrestled with these issues in our class discussions, I found that the most useful role I could fulfill was to help students relate these research-driven questions to the themes and concepts addressed in our seminar readings. In Mann's *1491*, for instance, he recounts the efforts of scholars to come to some consensus about pre-Columbian population figures. The struggles that my students encountered in their attempt to estimate the pre-contact population of their own research group gave them a new perspective on (and a greater interest in) these debates between "high-counters" and "low-counters" as represented in Mann's book. [20]

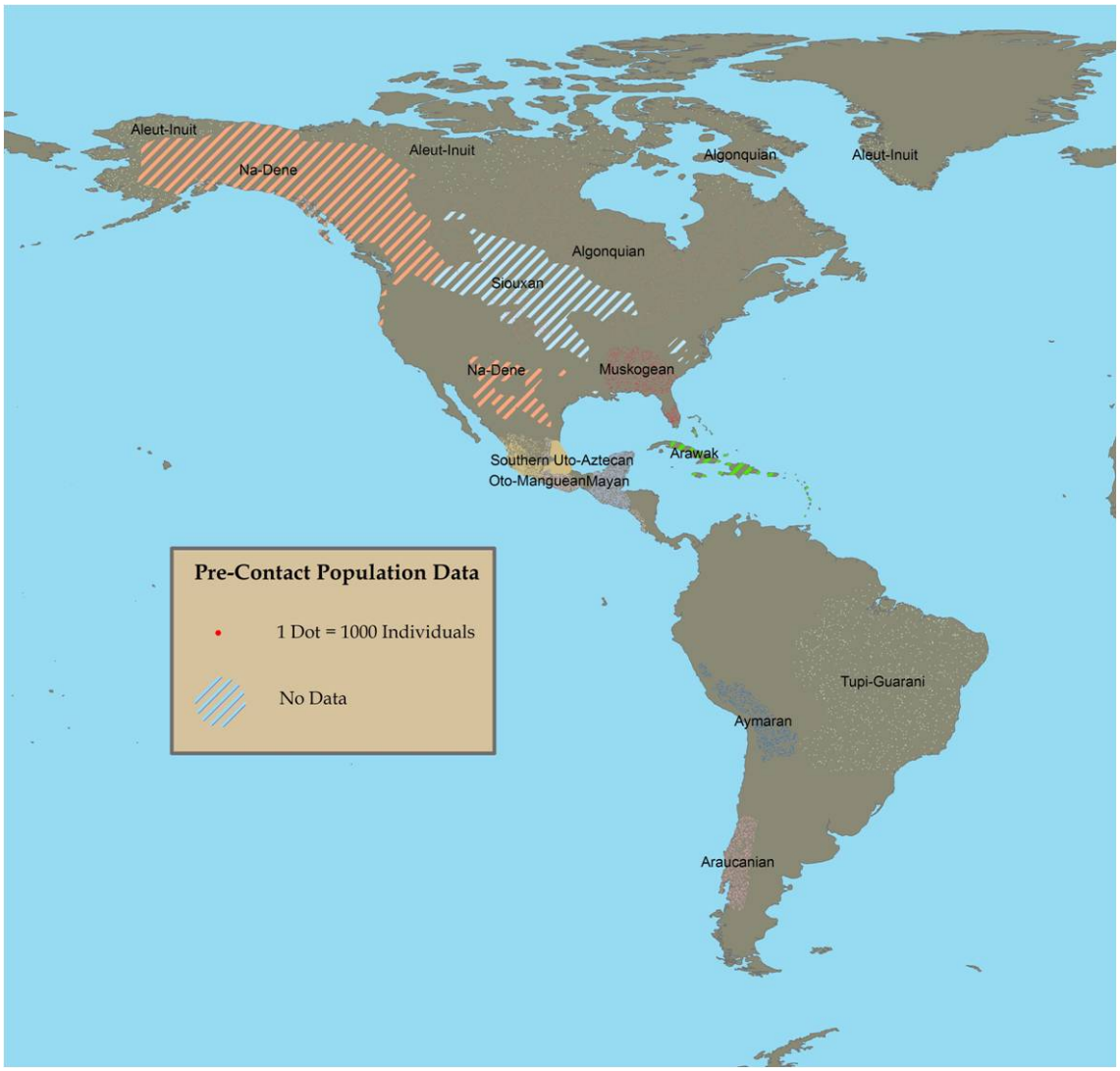

FIGURE 5: Pre-Contact Population Data

In one assignment, students were asked to track the expropriation of indigenous land by national governments. As students reviewed treaties, maps, and land records in an effort to map this dispossession, they became much more aware of the dramatic impact of this process. They also began to realize the centrality of Native American history to that of the United States, itself. One of Philip Deloria's main points in *Indians in Unexpected Places* is that the formation of American expectations about Native Americans not only produced the cultural discourse on what it meant to be "Indian," but also shaped perceptions of the nation as a whole. The visualization of land dispossession, (and the undertaking of the detailed research that made it possible), helped students grasp the scope of this process in a way that would not have occurred without the mapping project.

The project also obliged students to develop and critique the pragmatic decision-making skills that accompany historical research. What is the most logical

way to delimit ethnic transformation, for instance? What conventions govern the distinction between language and "dialect"? Each student faced these research problems individually, but the ERICA Project forced us to develop common principles to guide our research. We eventually settled on language as our primary identifier of culture groups for the interactive map, for instance, while allowing scholarly discretion on the part of individual student researchers to include data from different segments of a particular language group if they had a good rationale. The development of these common principles also gave (most) students an appreciation for careful annotation and citation, so as to specify to whom, exactly, their data applied. And the pedagogical effectiveness of GIS-based information mapping was not limited to student learning. The integration of student data into ArcMap inspired me to begin incorporating elements of my own research into a GIS format, both to demonstrate the software's capabilities to the students and to develop a better sense of place in my own work on late colonial and early national Mexico.

As mentioned above, I hope to expand the ERICA Project with each succeeding cohort of students in future semesters of the course, developing it incrementally into a more extensive, polished database. In this first semester, the goals of the project may have overstretched the time constraints of the initial semester. Both I and the students had to essentially "start from scratch," identifying and collecting bibliographic resources, primary documents, linguistic data, and historical maps for class use. I had to distribute student time between technological training and data collection. My decision to reduce GIS tutorials in favor of more dedicated research time limited students' ability to submit data in the optimum standardized format. The students did develop a good level proficiency in the use of the course management system, as it entailed a much lower learning curve than the ArcGIS suite. Hopefully future cohorts of students participating in the project will be able to take on even more of the integrative work themselves.

The GIS project helped the course meet a number of other objectives, as well. Most students acquired a good sense of ethnohistorical methodology during the semester, taking responsibility for their assigned research area and recognizing the need to go beyond traditional documentary source material. Students also engaged the course readings in a more confident manner than might otherwise have been the case. They seemed to feel like they had more to contribute, as each "student ethnographer" represented a particular cultural perspective on whatever theme the discussion might cover. By compiling research from each of these perspectives into a chronologically-dynamic digital map, the ERICA Project helped students develop a better sense of the big picture. Thus, student involvement in the project also helped address my concern that the seminar's in-depth readings and discussion might not provide a broad enough sense of the context of the Native American experience as a whole. Having forsaken much of the basic historical narrative except for what we

picked up through our discussions of the ERICA assignments and a few mini-lectures to help us along the way, we still managed to avoid the more superficial scope of an introductory survey.

As for the final product, an interactive map that could serve as a resource for the study of indigenous cultures across place and time, the ERICA Project in its current form has only modest merit as a usable tool for anyone other than my next wave of students. It did foster "spatial thinking" in the sense that students needed to seek sources and data that could be represented geographically, and then were able to view the compilation of this information. Still, the benefits of this process might have been heightened by a higher level of student engagement with the GIS software. However, the project certainly engendered "student ownership" of the learning process. A couple of students managed a relatively high degree of GIS proficiency on their own, with one even volunteering to continue both his research and its integration into the map database over the summer. A number of students plan to monitor the development of the project and asked me to keep them updated in the future. The ERICA Project will continue to mature as we incorporate successive waves of student research into the ArcGIS dataset. There is also great potential for the use of GIS technologies in the teaching of history in general. As historical information continues to become more abundant and diffuse, the valuable integrative ability of mapping technology should prove ever more useful in the classroom.

Endnotes

[*] Barry Robinson is Assistant Professor in the History Department at Samford University.

NOTES:

[1] Marshall Eakin, Vanderbilt University, unpublished statement of teaching philosophy, 2004.

[2] More information about Problem Based Learning, including links to relevant bibliography, can be found at: http://www.samford.edu/ctls/pbl_process.html, and in M. A. Albanese & S. Mitchell, "Problem-based learning: A review of the literature on its outcomes and implementation issues." *Academic Medicine*, 68 (1993): 52-81. Aside from reviewing pedagogical literature, I also benefitted from a PBL "swap shop" arranged by Samford's Center for Teaching and Learning. Faculty from across the university met to share ideas and PBL teaching strategies.

[3] Lynn D. Lampert, "Where Will They Find History? The Challenges of Information Literacy Instruction," *AHA Perspectives* 4, no. 2 (February, 2006).

[4] James Axtell, "Ethnohistory: An Historian's Viewpoint," *Ethnohistory* 26, no. 1 (Winter 1979): 2.

[5] Note that, in practice, the cultural sensitivity of some ethnohistorians (including Axtell) has been questioned by scholars such as Donald Grinde, Jr. and Amy E. Den Ouden. cf. Donald A. Grinde, Jr., "Teaching American Indian History: A Native American Voice," *AHA Perspectives* 32, no. 6 (September 1994); and Amy E. Den Ouden, "Locating the Cannibals: Conquest, North American Ethnohistory, and the Threat of Objectivity," *History & Anthropology* 18, no. 2 (June 2007): 101–133.

[6] Axtell, "Ethnohistory: An Historian's Viewpoint," 2–4.

[7] The site (literally) of some of these exceptions is the Electronic Cultural Atlas Initiative (ECAI), an online clearinghouse of digital information related to culture: http://ecai.org/index.html.

[8] See, for example, Raymond D. Fogelson, "The Ethnology of Events and Nonevents," *Ethnohistory* 36, no. 2 (Spring 1989): 133–148.

[9] Charles C. Mann, *1491: New Revelations of the Americas Before Columbus* (Knopf, 2005).

[10] Sinclair Thomson, *We Alone Will Rule: Native Andean Politics in the Age of Insurgency* (University of Wisconsin Press, 2002); Sean Michael O'Brien, *In Bitterness and in Tears: Andrew Jackson's Destruction of the Creeks and Seminoles* (Westport: Praeger, 2003); Philip J. Deloria, *Indians in Unexpected Places* (Lawrence: University Press of Kansas, 2004).

[11] Rigoberta MenchúTum and Elisabeth Burgos-Debray, *I, Rigoberta Menchu: An Indian Woman in Guatemala* (Verso, 1987).

[12] For more information on ArcGIS, including the ArcMap and ArcCatalog software used for the ERICA Project, see Bob Booth and Andy Mitchell, *Getting Started with ArcGIS*. (Redlands, CA: ESRI Press, 1999-2001).

[13] Julian J. DelGaudio, "Should Historians Become Programmers? Limitations and Possibilities of Computer-Assisted Instruction in the United States History Survey," *The History Teacher* 33, no. 1 (Nov. 1999): 67-78.

[14] At the time the course management software was undergoing a shift from WebCT to Blackboard, so technically the software version used for the course was WebCT6.

[15] Philip Brown, "Exploring Historical Space and Environments in the History/Social Studies Classroom: An Introduction," *Journal of the Association for History and Computing*, Fall 2008.

[16] Christian Folini has discussed the challenges and merits of historical database creation and usage in "How do I Bring Barzabal Facin on the Screen? A Student in Search of Suitable Database Architecture," *History & Computing* 12, no. 2 (2000): 203-214.

[17] See Figure 2: Sample Student Submission through Course Management System.

[18] See Figure 1: Electronic Resource on the Indigenous Cultures of the Americas.

[19] See Figures 3 and 4. Figure 4 displays the three place names discussed in Figure 3, with two others for reference. Selecting an individual star on the map brings up translation, etymological description, and references for the place name.

[20] Mann, 92-96, 132-133.